IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1 (Currently Amended): A position detecting method for detecting positional information in a predetermined measurement direction of a mark formed on a substance an object, comprising:

picking-up at least one image of said mark under an image pick-up condition including a plurality of defocus states;

obtaining estimating a relationship between picked-up image state a position of the picked-up image of said mark in said predetermined measurement direction and said defocus amount[[,]] based on image pick-up results in said image pick-up condition[[;]] , and detecting estimating said positional information in said predetermined measurement direction of said mark based on said the estimated relationship.

2 (Original): The position detecting method according to claim 1, wherein

in said picking-up the image, said image of said mark is picked-up on an image pick-up plane which tilts against an imaging plane on which said image of said mark is formed.

3 (Currently Amended): The position detecting method according to claim 1, wherein

in said obtaining said relationship a estimating said positional information of said mark, positional information of said a characterized point at of said mark in a focus state is estimated by using from said image picked-up pick-up results at in said plurality of said defocus states.

4 (Currently Amended): The position detecting method according to claim 3, wherein in said ~~obtaining said relationship a~~ estimating said positional information of said mark, estimating positional information of said characterized point ~~at a~~ in said focus state is ~~estimated, considering a respective~~ performed in consideration of contrast of each image pick-up ~~results at~~ result in said plurality of said defocus states.

5 (Currently Amended): The position detecting method according to claim 3, wherein said plurality of defocus states include ~~either plus defocus states or minus defocus state~~ one of a state of defocusing in one direction from said focus state and a state of defocusing in the other direction from the focus state, and

a position of said characterized point ~~at~~ in said focus state is estimated by an extrapolation method using positions of said characterized point obtained from said image pick-up results ~~at~~ in said defocus states.

6 (Currently Amended): The position detecting method according to claim 3, wherein [[a]] said plurality of ~~said~~ defocus states include ~~a plus defocus state and a minus defocus state~~ a state of defocusing in one direction from said focus state and a state of defocusing in the other direction from the focus sate, and

a position of said characterized point ~~at~~ in said focus state is estimated by an interpolation method using positions of said characterized point obtained from said image pick-up results ~~at~~ in said defocus states.

7 (Currently Amended): The position detecting method according to claim 1, wherein

said image pick-up condition further comprises a focus state, and ~~said obtaining~~

~~relationship comprises: estimating~~

in said estimating said positional information of said mark, [[a]] positional

information of ~~said~~ a characterized point ~~at~~ in said focus state ~~using said picked up image at~~

is estimated based on image pick-up result in said focus state and image pick-up results in

said plurality of defocus states; ~~and further~~

~~estimating said positional information of said characterized point at said focus state~~

~~using said picked up image at said focus state~~.

8 (Currently Amended): The position detecting method according to claim 7, wherein

in said ~~detecting~~ estimating said positional information of said mark, said positional

information is estimated in consideration of ~~, considering a respective~~ contrast of each image

pick-up ~~results at~~ result in said plurality of defocus states and image pick up result in said

focus state.

9 (Currently Amended): The position detecting method according to claim 7, wherein

said plurality of defocus states include ~~either plus defocus states or minus defocus~~

~~states~~ one of a state of defocusing in one direction from said focus state and a state of

defocusing in the other direction from the focus sate, and

a position of said characterized point ~~at~~ in said focus state is estimated by an

extrapolation method using positions of said characterized point obtained from results ~~at~~ in

said defocus states.

10 (Currently Amended): The position detecting method according to claim 7,

wherein

said plurality of defocus states include a plus defocus state and a minus defocus state

a state of defocusing in one direction from said focus state and a state of defocusing in the

other direction from the focus sate, and

a position of said characterized point mark at in said focus state is estimated by an

interpolation method using positions of said characterized point obtained from said image

pick-up results at in said defocus states.

11 (Currently Amended): The position detecting apparatus which detects a positional

information in a predetermined measurement direction of a mark formed on a substance an

object, comprising

an imaging optical system[[,]] which forms an image of the said mark;

an image pick-up unit which picks-up the image of the said mark formed by the said

imaging optical system; and

a processing unit[[,]] which is electrically connected to said image pick-up unit, and

which obtains said estimates a relationship between picked-up image state of the a position of

the picked-up image of said mark in said predetermined measurement direction and defocus

amount based on the image pick-up results by using said the image pick-up unit under an

image pick-up condition including a plurality of defocus states, and estimates positional

information in said predetermined measurement direction of said mark based on the estimated

relationship.

12 (Original): The position detecting apparatus according to claim 11, wherein

a surface condition of said mark is changing along a predetermined direction, and

said image pick-up unit comprises a image pick-up plane which is rotated around a

direction in an imaging plane on which said image is formed by said imaging optical system

corresponding to said predetermined direction.

13 (Original): The position detecting apparatus according to claim 12, wherein

said image pick-up plane intersects said imaging plane.

14 (Original): The position detecting apparatus according to claim 11, further

comprising:

a tilt adjustment mechanism which adjusts rotation amount of an image pick-up plane

of said image pick-up unit around a direction in an imaging plane on which said image is

formed by said imaging optical system corresponding to said predetermined direction.

15 (Original): The position detecting apparatus according to claim 11, further

comprising:

a moving mechanism which relatively moves a imaging plane, on which said image of

said mark is formed by said imaging optical system, and said image pick-up plane of said

image pick-up unit along an optical axis direction of the imaging optical system.

16 (Original): An exposure method for transferring a predetermined pattern to a

divided area on a substrate, comprising:

detecting a positional information of marks formed on the substrate for a position

detection by using said method according to claim 1, obtaining a predetermined number of

parameter for a position calculation of said divided area, and calculating an arrangement

information of the divided area on the substrate; and

transferring the pattern to the divided area while controlling a position of said

substrate, based on the arrangement information of said divided area.

17 (Original): An exposure apparatus which transfers a predetermined pattern to a

divided area on a substrate, comprising:

a stage unit which moves said substrate along a moving plane; and

a position detecting apparatus according to claim 11, which detects positional

information of said marks on the substrate mounted on the stage unit.

18 (Currently Amended): A making method of an exposure apparatus for transferring

a predetermined pattern to a divided area on a substrate, comprising:

providing a stage unit which moves the said substrate along a moving plane; and

providing a position detecting unit[[,]] which detects [[a]] positional information in a

predetermined measurement direction of a mark on said substrate, which is said substrate

being mounted on the stage unit, wherein the position detecting unit comprises:

an imaging optical system which forms an image of the mark, formed on the

substrate;

an image pick-up unit which picks-up [[a]] the image formed by said imaging optical

system; and

a processing unit electrically connected to said image pick-up unit, which obtains

estimates a relationship between picked-up image state of the respective a position of the

picked-up image of said mark in said predetermined measurement direction and defocus

amount based image pick-up ~~results~~ <u>result</u> by using ~~the~~ <u>said</u> image pick-up unit under an image pick-up condition including a plurality of defocus states, and ~~detects~~ <u>estimates</u> positional information <u>in said predetermined measurement direction</u> of ~~the marks~~ <u>said mark</u> based on the <u>estimated</u> relationship.

19 (Currently Amended): A computer readable recording medium containing data for a control program to be executed by a position detecting unit to detect ~~a mark position~~ <u>positional information in a predetermined measurement direction of said mark</u> formed on a substrate, wherein

the <u>said</u> control program comprises:

allowing to pick-up at least one image of said mark under an image pick-up condition including a plurality of defocus states;

allowing to ~~obtain~~ <u>estimate</u> a relationship between ~~the picked-up image state~~ <u>a position</u> of said mark <u>in said predetermined measurement direction</u> and defocus amount, <u>and to estimate positional information in said predetermined measurement direction of said mark based on the estimated relationship</u> ~~; and~~

~~allowing to detect a positional information of said mark, based on the relationship.~~

20 (Original): A device manufacturing method including a lithographic process, wherein

an exposure is preformed by using said method according to claim 18 in said lithographic process.